# **Volume Expansion User Guide**

# **Important Notice:**

## The Volume Expansion Members must have volume created by its own management tool. On the other hand, volume has created from standard system RAID volume creation is unable to join Volume Expansion Group.

With ThecusOS<sup>™</sup> 5.0, one of the greatest feature is Dynamic Volume Expansion. With Volume expansion, the user has the choice to expand its storage capacity whenever required. A total of 8 physical volumes can be added for expansion and become on large logical volume to be managed under one system only.

To start with volume expansion, in the user UI, go to the **Storage** menu, choose the **Volume Expansion Management** item and the **Volume Expansion Management** screen appears. From here, you can see 2 major categories, "Expansion Management" and "Expansion Member Creation".

Expansion Management: This is going to manage the joined volume members.

Expansion Member Creation: This one is to create a volume member from the current system. Each system is only allowed to create one volume member.

The volume expansion is only supported with 10G NIC, installed and connected. If no 10G NIC is found, the message below will appear.

Atten	tion 10GbE card connection fail.
NOTE	Volume expansion requires 10G environment to work. It could be either connected through a 10G switch or connected as peer to peer in between systems. The total of members that can be created in a volume expansion group is 8.
NOTE	Volume expansion with a single additional system contains 2 elements: "Expansion Management" and "Expansion Member Creation". It is not necessary to have a member belonging to the system which manages the volume expansion group.

**Expansion Member Creation** If your 10GbE is installed and connected then let's start with volume member creation.

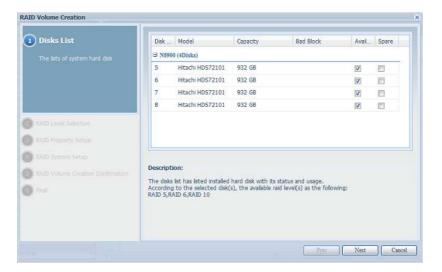
۹. 🛛	Home > Storage > 1	Volume Expansio	n Management	j.	() Help	🖓• My favorite	ڻ Shutdown	杻 Logout
📜 System Information 🔹								
🗙 System Management 🔹		Expans	ion Manageme	nt –	-	Expansi	on Member Creati	ion
System Network	ER PE		ected volumes to sion Managemen			Provide vo	umes under high sp network.	beed
Storage 🖃	C3. C	Expan	sion Managemen			8	network.	
RAID Management NAS Stacking ISO Image Mounting Share Folders ISCSI High-Avalability Volume Expansion Management	Expansion Manae RAID ID: Stripe (KB): File System: RAID Status: Capacity: Refresh	Grate B Expand	C Remove R	suspend 🏵 Rea	ume			i i
	IPv4	Host Name	RAID ID	RAID Level	Capacity	Spare	Status	
User and Group Authentication *								
Network Service								
Application Server								
Backup 🕘	Apply Cano	£]						

Click on "Expansion Member Creation", and then select "Create" to start.

	nber G	Usin	xpansion M g connected Expansion M	volumes to	buid	6 <sup>u</sup> d	the density of	on Member Creation lumes under high spe- network.
ansion Mer								
		/e 🗣 I	Refresh 🕮 🛛	lisconnect	Reconnect			

The volume creation wizard appears and leads you to complete the volume creation.

1. Select the available disks from the system. Please be notified that the volume has to be RAID5, RAID6, RAID10, RAID50 or RAID60.



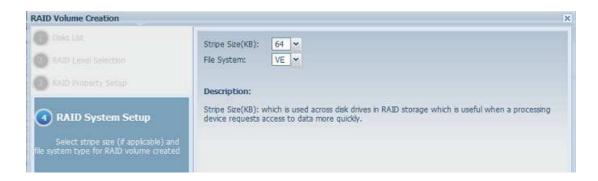
2. Choose the desired RAID mode from the available RAID type.

Deks List	RAID Level:	RAID 5	O RAID 6	O RAID 10
2 RAID Level Selection	Description:			C RAID 10
System will list available RAID level can be choose from	RAID 6: Exten two parity block	d RAID 5 by addin ks distributed acros	g an additional par ss all member disks	ity block; thus it uses block-level striping with i.
	RAID 10: A Str over these.	ripe of Mirrors. Mul	tiple RAID 1 mirror	is are created, and a RAID 0 stripe is created
RAID Property Satur				
RAID System Setup				
RAID Volume Creation Confirmation				
🔘 Finai				
				Prev Next Cancel

3. Give a name to the RAID ID.

KAID Volume Creation		X
Diska Last	RAID ID: RAIDOI	
RAID Property Setup     Setup RAID property in varies stuation per needed	Description: RAID ID: alow 0-9, a-z, A-Z and which is required and unique.	

4. Specify the stripe size. The file system is "VE" as default and can't be changed.



5. After confirmation, the RAID volume settings information will appear.

	RAID Volume Creation	contimation	
RAID Level Selection	Field	Value	
🕽 RAID Property Situp	Disks List RAID Level	5,6,7,8 RAID 5	
RAID System Setup	RAID ID	RAID01	
5 RAID Volume Creation	Quick Raid Stripe Size(KB) File System	No 64 KB VE	
Confirmation			

6. Click finish to confirm the RAID volume creation.

RAID Volume Creation	
Ches and     RAID Level Selector	The RAID volume creation will start after [Finish] button pressed. During the RAID volume creation period all of active services will be stopped.
RAID Property Solup	
RAID System Setue	
🔘 RAID Volame Creation Confirmation	
6 Final	
RAID volume is eation has all its setup complete	
	Firish

7. Volume creation is started. It may take a few hours depending on the HDD capacity.

1	1			Expansion M Ig connected Expansion M	volumes to	build	580	Provide volum	Member Creation hes under high speed hetwork.
	nsion Mer								
	RAID ID	RA	Tray	Capacity	Spare	Reconnect Status	Network Int	Target	Connection
4	641001	5	J	2787 GB	N/A	building (0.3	192.108.3.2	Please input	Disconnecceo
					Г	🗘 Data Processi			

8. After volume creation is completed, the volume will be listed as below and ready to join as a member on the volume expansion group.

har	ision Men	aber C			10000	build	583	Provide volu	Member Creation nes under high spee network.
ò	Grente 🤤	h.cmays	R	efresh GC	prinect 🔊	reconnect			
0	0.000	201100		Capacity	Spare	Status	Network Int	Target	Connection

Now, we have successfully created a volume expansion member. This will be our sample unit 1, WAN/LAN1 IP 172.16.64.191, 10G NIC IP 192.168.5.254 and RAID5.

Since the volume expansion function only works in a 10G environment, a 10G IP will be needed as a key to manage the volume expansion group.

			Expansion Ma sing connected v Expansion Ma	/olumes to b	1954 1967 (1977)	580	Provide volum	Member Creation les under high speed letwork.
	-	reatio	_					

Our sample unit 2 is WAN/LAN1 IP 172.16.66.111, 10G NIC IP 192.168.5.250 and the volume used for volume expansion is created in RAID10.

1	<b>.</b>			Expansion Ma ing connected v Expansion M	volumes to b		580		on Member Creation olumes under high speer network.
nar	ision Men	aber C	reatio	n					
		Remove	= 💲 R	efresh 💶 Disc		are to collect to co	Machine de Tale		
		Remove	= 💲 R	efresh 💶 Disc	onnect <i>Ø</i> F Spare	Reconnect Status	Network Int	Target	Connection

# **Volume Expansion Management**

Since the volume expansion function only works in a 10G environment, a 10G IP will be needed as a key to manage the volume expansion group. Let's use our

sample unit 2 with 10G IP 192.168.5.250 to manage the volume expansion group. The screen shot below shows the installed and connected 10G NIC with the IP 192.168.5.250.

🕖 System Information 🕚	WANALAN1 LAN2	LAN3 Additional LAN4 Addition	nal LANS	
🗙 System Management 🖃	Status:	Normal	Speed:	10000Mb/s
System Network =	MAC Address:	00:14:FD:12:F7:80	Link Status:	Connected
Metworking	Jumbo Frame:	1500 v bytes	IPv6	
South Contraction Contraction	Enable: Mode:	☑ ● Manual ● DHCP	Enable: Mode:	Manual O DHCP
	: IP:	192.168.5.250	IP:	fecture
Storage 🔹	Netmask: Gateway:	255.255.255.0	Prefix Length: Gateway:	64
See and Group Authentication	Jaceway.		cateria).	
P Network Service	Note:			

Let's add a 1<sup>st</sup> expansion volume group member. From the expansion volume created, fill in the "Target" IP address "192.168.5.250". It means that this expansion volume is going to join the associated volume group.

Please make sure that the joined member has the same network subnet.

ſ	- <b>B</b> .			Expansion M sing connected Expansion M	volumes to b		5 <sup>e</sup> d	Provide volume	tember Creation es under high speed etwork.
ап	ision Mer	nder C	reatio	on					
	Create 🤤	Remov	e 🤤 R	lefresh 🚺 Disc	connect 🍠	Reconnect			
0	RAID ID	RA	Tray	Refresh Disc Capacity 1858 GB	connect 🝠 F	Reconnect Status	Network Int	Target	Connection

Press "Apply" to confirm the setting.

0	Create 🤤	Remove	e 🤤 R	efresh 💽 Disconn	iect 🔊 R	leconnect			
	RAID ID				Spare		Network Int	Target	Connection
1	RAID02	10	1,	1858 GB	N/A	Healthy	192.168.5.250	192.168.5.250	Disconnected
_									
A	pply								

After confirmation, the connection status will change from "Disconnected" to "Connected".

				angest talset i the	anagement				es under high spee etwork.
Cri	0.000 000 000 000	<i>lem</i> ove	Ş R	efresh 🗊 Diso Capacity	onnect 🍠 R	Reconnect Status	Network Int	Target	Connection

Go to the "Expansion Management" screen, click on "Create", a member is ready to be joined.

		ion Manageme ected volumes to Ision Managemen	build	<b>F</b> <sup>H</sup> C	on Member Creation olumes under high speed network.
xpansion Manag	jement				
AID ID:	[				
tripe (KB):	~				
le System:	~				
AID Status:					
apacity:					

	Using conn	ion Manageme ected volumes to sion Managemen	build			on Member Creation olumes under high spee network.
pansion Manag	ement					
AID ID:						
ripe (KB):	64 💌					
	XFS ¥					
ID Status:	ALC IN					
pacity:						
puciey.						
	eate 😹 Expand 🌾	Remove 🕕 Sc	uspend 🕟 Resume			
💲 Refresh 📀 Cr						
Sefresh Ori	Host Name	RAID ID	RAID Level	Capacity	Spare	Status

Next, input the RAID ID (We used "ve01" as our example) and select the member to be joined by clicking on it. Confirm by pressing "Apply" to complete the Volume Expansion creation.

St Fi R	AID ID: tripe (KE le Syster AID Stat apacity:	m: XF						
		iresh 💿 Create	e 🛼 Expand 🥥 Host Name	Remove 📵 Suspe	end  Resume RAID Level	Capacity	Spare	Status
	1 19	92.168.5.250	N8900	RAID02	10	1858 GB	N/A	Healthy
	Apply	/ Cancel						

After the volume expansion management has successfully created and a member joined, then the VE volume "ve01" will display the information as shown below. The volume size is noted to be 1855.2GB with an Healthy RAID. The joined member is listed with information about its capacity and status.

		Using conn	ion Manageme ected volumes to sion Managemen	build		ion Member Creati olumes under high spe network.
Expar	nsion Manag	ement		1		
RAID Stripe	ID: : (KB):	ve01				
	ystem: Status:	XFS Y			Used	
RAID : Capac	Status: ity:	Healthy 1855.2 GB eate Scenard C	Remove T Su	uspend ® Resume	Unus	Status

Now let's add more members to the volume "ve01". Let's take our sample unit 1 and add the created volume from it. Please follow the procedure below.

Select the created VE volume from the system.

1	8			Expansion M ing connected Expansion M	/olumes to bi		580	Provide volum	Member Creation es under high speed etwork.
nar	cion Mon	bor C	roatio	n					
	Greate 😂	Remove	e 🤤 R	efresh 💶 Disc	onnect ØF	Reconnect	Network Int	Target	Connection

Input the "Target" IP address for which VE volume this unit is going to join. Click on "Please input....."

0	Create 🤤	Remov	e 🤤 R	efresh 💶 Disc	onnect 🔊 F	Reconnect			_
		DA	Trav	Capacity	Spare	Status	Network Int	Target	Connection
	RAID ID	KA	iiay	Capacity	opure	Status	indemone anemi	ranger	oonnoccion m

In this case, this unit is going to join the "ve01" which the IP is 192.168.5.250. So simply input 192.168.5.250, then click "Apply" to confirm.

Create       Refresh TDisconnect         RAID ID       RA       Tray       Capacity       Spare       Status       Network Int       Target       Connection	5	8		Expansion Ma sing connected v Expansion M	volumes to b	1000 C	5 <sup>e</sup> d	Provide volu	Member Creation mes under high speed network.

After confirmation, the status will changed from "Disconnected" to "Connected"

Expai	nsion Men	nber C	reatio	n					
•	Create 🤤	Remov	e 🤤 R	efresh 🗈 Discor	nnect 🔊 F	Reconnect			
	RAID ID	RA	Tray	Capacity	Spare	Status	Network Int	Target	Connection
1	RAID01	5	5,	2787 GB	N/A	Healthy	192.168.5.254	192.168.5.250	Connected

Now, go back to the system 192.168.5.250 which is our volume expansion management unit and open the volume expansion management page, click on "Expand". The available volume which can be joined as a member will be listed.

As shown in the screen shot below, it is listed that there is a VE volume from the system N8900pm (sample unit 1) available. This is the VE volume that was just generated to join "ve01", this unit IP address is 192.168.5.254.

xpansion Ma	nagement					
AID ID:	ve01					
tripe (KB):	64 💙			📁 Used		
le System:	XFS 👻			Unus		
AID Status:	Healthy			/		
apacity:	1855.2 GB					
🔓 Refresh 🌾	Oreate 😹 Expand 🌘	Remove 🛈 S	uspend 💽 Resume			
IPv4	Host Name	RAID ID	RAID Level	Capacity	Spare	Status
	1.5.254 N8900pm	RAID01	5	2787 GB	N/A	Healthy

Click "Apply" to confirm and the display will be as shown in the screen shot below.

The volume expansion has successfully expanded its size from 1855.2GB to 4639.5GB. The volume expansion group ve01 now contains 2 members (2 units).

	> Storage > \	/olume Expansi	on Managemei	nt	(2) Help Q.	My favorite 🕻	5- Shutdown	조건 Logout
		Using conn	ion Managemen ected volumes to b ision Management		<sup>9</sup> 0	- <b>1</b>	ion Member Cre olumes under high network.	
Expan	nsion Manage	ment						
RAID I		/e01			6			
Capaci	/stem:	64 Y KFS Y Healthy 4639.5 GB	Remove 🕡 Sus	pend ® Resume	Used			
File Sy RAID S Capaci	/stem:	KFS 🖌 Healthy 4639.5 GB	Remove T Sus	pend ® Resume RAID Level			Status	
File Sy RAID S Capaci	rstem: Status: H Ity: 2 Refresh OCre	KFS V Healthy 4639.5 GB ate S Expand G Host Name			Unus	ed	Status Healthy	

# **Suspend Volume Expansion**

If for any reason, the volume expansion volume needs to be stoped, simply click "Suspend".

	> Storage > Vo	some expans	on nanayen	CIIC	Wileb V	HAVENULLE V	り・Shutdown :	<u>л</u> . со,
5		Using con	ision Managem inected volumes t ansion Manageme	to build	9.9		volumes under high network:	
Expan	nsion Managen	ient		1				
RAID I	ID: 😽	H01						
RAID I Stripe	inter a la l	-			- thead			
	(KB):	-			Used			
Stripe File Sy	(KB):	~			The second			
Stripe File Sy	(KB): 6 stem: X Status: H				The second			
Stripe File Sy RAID S Capaci	(KB): 6 stem: 30 Status: Hi Ity: 44	saithy 539.5 G8			Unus			
Stripe File Sy RAID S Capaci	(KB): 6 stem: X Status: H	saithy 539.5 G8	Remove 🐨 Sa	Uspend Pilcource	Unus			
Stripe File Sy RAID S Capaci	(KB): 6 stem: 30 Status: Hi Ity: 44	saithy 539.5 G8	Remove T Sa	uspend P ticourse RAID Level	Unus		Status	
Stripe File Sy RAID S Capaci	(KB): or stem: 20 Status: He Ity: 46 Refresh @Creat	saithy 339.5 GB Bo Expand	Concernance of the second	and the second s	Unus	ed	Status	

Once "Suspend" is clicked, all of its members will become offline and the VE RAID info will become blank.

Home >	Storage > Vo	lume Expans	ion Managem	ent	1 Heb	My favorite	<b>心</b> + Shutdown	杞 Logout
	<b>O</b> <sub>Q</sub>	Using con	ision Managem nected volumes 1 msion Manageme	o buid	<b>5<sup>0</sup>7</b>		ision Member Cro volumes under hig network.	
Expan	ision Managem	ent						
Stripe	50 <u>-</u>	~						
File Sy		~	J					
RAID S	Status:							
Capaci	ty:							
	Refresh 29County	Nireard 6	Remove The	sound PResume				
	IPv4	Host Name	RAID ID	RAID Level	Capacity	Spare	Status	
1	192.168.5.250		RAID02	10	N/A	N/A	Offine	_
2	192.168.5.254	N8900pm	RAID01	5	N/A	N/A	Offline	

The members will also be shown as "Disconnected" after the volume is suspended.

			/ Capacity 1858 GB	Spare N/A	Status Healthy	Network Int 192.168.5.250	Target 192.168.5.250	Connection Disconnected
	002 10	) 8,	1858 GB	N/A	Healthy	192.168.5.250	192.168.5.250	Disconnected
acian I								
Greate	<b>O</b> Rm	1944 <b>-</b>	Refresh 🕮 (kao	onnest 🌽 F	Reconnect			

At this point, all of the joined members are off-line and their data is inaccessible.

### **Resume Volume Expansion**

To resume the volume expansion volume, there are two ways.

1. Click on "Resume" and the system will automatically reconnect to the members every 5 minutes. If all its members can be reconnected, then the volume will resume.

Please click on "Refresh" if the information does not show in time.

expansion re	anagement					
RAID ID:	ve01					
Stripe (KB):	64 🗙			Used	i	
File System:	NPS ~			Unus		
RAID Status:	Healthy			1		
2000						
Capacity;	4639.5 GB					
	4639.5 GB	Remove TS	uspend 🗩 Résulte			
Capacity:		Remove This	RAID Level	Capacity	Spare	Status
Refrest IPv4	O Grote So Expand	ACCESSION AND A	Strength and strength	Capacity 1858 GB	Spare N/A	Status Healthy

2. Click on "Resume" then manually go to each member and click on "Reconnect".

Ð	Create 😋	Removi	r 🖷 R	etresh Class	onnect 🗾	Reconnect			
	RAID ID	RA	Tray	Capacity	Spare	Status	Network Int	Target	Connection
1	RAID02	10	8,	1858 GB	N/A	Healthy	192.168.5.250	192.168.5.250	Disconnected
n	sion Men	iber Ci	reation	n					
					nnest 💋 F	leconnect			
		Remove	⊊ Re	efiesh 🕱 (hea	spare	leconnect	Network Int	Target	Connection

The volume expansion is back and ready to perform.

		Using con	sion Managem nected volumes b insion Manageme	o buid	9 <sup>9</sup> 0		sion Member Creati volumes under high spe network.
xpar	nsion Managem	ent		5 A.			
ile Sy (AID ! Capaci	(KB): 64 stem: XF Status: He Ity: 46	althy 39.5 GB	Remove 🕫 Su	spend P.fezaree	Used		
	IPv4	Host Name	RAID ID	RAID Lével	Capacity	Spare	Status
1	192,168.5,250	N8900	RAID02	10	1858 GB	N/A	Healthy
2	192.168.5.254	NODODOD	RAID01	5	2787 GB	N/A	Healthy